

**Birla Institute of Technology and Science, Pilani**

**Pilani Campus-Rajasthan**

**End-Semester Exam – ECON-F354/ FIN F311**

**Open Book**

**PART-B**

**Maximum Marks:60**

**Dated: 17/May/2022**

**Time Duration: 90 Minutes (Max)**

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**Instructions:**

- Do not forget to write your Name and ID number on the answer sheet
- You need to write the answers in the separate answer booklet provided to you and submit to the invigilator before leaving the examination room. Failing to do so will result in zero marks in this evaluative component
- Read question specific instructions before giving your answers
- **To get the full score, you need to show all the steps required to arrive at the final answer with proper interpretation**

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Q1: (A) An investor is said to take a position in a “collar” if she buys the asset, buys an out-of-the-money put option on the asset, and sells an out-of-the-money call option on the asset. The two options should have the same time to expiration. Suppose Marie wishes to purchase a collar on Hollywood, Inc., a non-dividend-paying common stock, with six months until expiration. She would like the put to have a strike price of \$45 and the call to have a strike price of \$75. The current price of Hollywood’s stock is \$60 per share. Marie can borrow and lend at the continuously compounded risk-free rate of 7 percent per annum, and the annual standard deviation of the stock’s return is 50 percent. Use the Black–Scholes model to calculate the total cost of the collar that Marie is interested in buying. What is the effect of the collar? [17 Marks]

(B) A stock is currently priced at \$50. The stock will never pay a dividend. The risk-free rate is 12 percent per year, compounded continuously, and the standard deviation of the stock’s return is 60 percent. A European call option on the stock has a strike price of \$100 and no expiration date, meaning that it has an infinite life. Based on Black–Scholes, what is the value of the call option? Do you see a paradox here? Do you see a way out of the paradox? [3 Marks]

Q2: (A) There is a European put option on a stock that expires in two months. The stock price is \$73, and the standard deviation of the stock returns is 70 percent. The option has a strike price of \$80, and the risk-free interest rate is a 5 percent annual percentage rate. What is the price of the put option today using one-month steps? [8 marks]

(B) In the previous problem, assume that the exercise style on the option is American rather than European. What is the price of the option now? [12 Marks]

Q3: You are currently working for Clissold Industries. The company, which went public five years ago, engages in the design, production, and distribution of lighting equipment and specialty products worldwide. Because of recent events, Mal Clissold, the company president, is concerned about the company's risk, so he asks for your input. Mal has provided you with the following option prices on four call options that expire in six months. The risk-free rate is 4 percent, and the current stock price is \$53.

Scenario	Strike Price	Option Price
1	50	\$12.78
2	55	10.14
3	60	7.99
4	65	5.81

You are required to calculate the implied volatilities for each of the scenario given in the above table. In addition, explain with proper reasoning on the relationship between implied volatility and option price, and implied volatility and strike price. [20 Marks]